

THE FRIEDMANNIAN MODEL OF OUR OBSERVED UNIVERSE

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ABSTRACT. According to observations, in our Universe for gravitational phenomena in a Newtonian approximation the Newtonian non-modified relations are valid. The Friedmann equations of universe dynamics describe infinite number of relativistic universe models in Newtonian approximation, but only in one of them the Newtonian non-modified relations are valid. From these facts it results that the Universe is described just by this only Friedmannian universe model with Newtonian non-modified relations.

According to observations – realized in the course last five centuries – in our *expansive homogeneous and isotropic relativistic Universe* for gravitational phenomena in Newtonian approximation the Newtonian non-modified relations are valid.

The Friedmann general equations of homogeneous and isotropic relativistic universe dynamics [1] describe infinite number of homogeneous and isotropic relativistic universe models in Newtonian approximation, but only in one of them the Newtonian non-modified relations are valid [2].

From these facts it results unambiguously that our observed Universe is described just by this only Friedmannian model of universe with Newtonian non-modified relations.

The deductive-reductive determination of the Friedmannian model of universe with Newtonian non-modified relations you can see in [3].

The Friedmannian model of universe with Newtonian non-modified relations, i.e. Friedmannian model of the *(flat) expansive non-decelerative (homogeneous and isotropic relativistic) Universe (with total zero and local non-zero energy)* (ENU) [4] is a special partial solution of the Friedmann general equations of homogeneous and isotropic relativistic universe dynamics:

$$\dot{a}^2 = \frac{8\pi G\rho a^2}{3} - kc^2 + \frac{\Lambda a^2 c^2}{3}, \quad (1a)$$

$$2a\ddot{a} + \dot{a}^2 = -\frac{8\pi Gpa^2}{c^2} - kc^2 + \Lambda a^2 c^2, \quad (1b)$$

with $k = 0$, $\Lambda = 0$ and a state equation [5]:

$$p = -\frac{1}{3}\varepsilon, \quad (2)$$

where a is the gauge factor, ρ is the mass density, k is the curvature index, Λ is the cosmological member, p is the pressure, and ε is the energy density.

The Friedmann equations (1a) and (1b) with $k = 0$, $\Lambda = 0$ and the state equation (2) determine the parameters of Friedmannian model of ENU, which we express –

for better transparency – in all possible variants [2], [3]:

$$a = ct = \frac{c}{H} = \frac{2Gm}{c^2} = \sqrt{\frac{3c^2}{8\pi G\rho}}, \quad (3)$$

$$t = \frac{a}{c} = \frac{1}{H} = \frac{2Gm}{c^3} = \sqrt{\frac{3}{8\pi G\rho}}, \quad (4)$$

$$H = \frac{c}{a} = \frac{1}{t} = \frac{c^3}{2Gm} = \sqrt{\frac{8\pi G\rho}{3}}, \quad (5)$$

$$m = \frac{c^2 a}{2G} = \frac{c^3 t}{2G} = \frac{c^3}{2GH} = \sqrt{\frac{3c^6}{32\pi G^3\rho}}, \quad (6)$$

$$\rho = \frac{3c^2}{8\pi Ga^2} = \frac{3}{8\pi Gt^2} = \frac{3H^2}{8\pi G} = \frac{3c^6}{32\pi G^3 m^2} = -\frac{3p}{c^2}, \quad (7)$$

$$p = -\frac{c^4}{8\pi Ga^2} = -\frac{c^2}{8\pi Gt^2} = -\frac{c^2 H^2}{8\pi G} = -\frac{c^8}{32\pi G^3 m^2} = -\frac{c^2 \rho}{3} = -\frac{1}{3}\varepsilon, \quad (8)$$

where t is the cosmological time, H is the Hubble “constant”, and m is the mass of ENU.

From relations (3)–(8) it results that the parameters of ENU are mutually linearly linked. For fundamental parameters of ENU are valid relations [2], [6]:

$$m = Ca = Dt, \quad (9)$$

where C and D are (total) constants:

$$C = \frac{m}{a} = \frac{m}{ct} = \frac{Hm}{c} = \sqrt{\frac{8\pi G\rho m^2}{3c^2}} = \frac{c^2}{2G} = 6.734\,67(15) \times 10^{26} \text{ kg m}^{-1}, \quad (10)$$

$$D = \frac{cm}{a} = \frac{m}{t} = Hm = \sqrt{\frac{8\pi G\rho m^2}{3}} = \frac{c^3}{2G} = 2.019\,00(37) \times 10^{35} \text{ kg s}^{-1}. \quad (11)$$

The matter-space-time properties of ENU [7] you can see in [6].

References

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